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ABSTRACT

Many age-related biologic and physiologic changes can have important influences on drug pharmacology in elderly persons. Successful management depends upon good communications among health care providers, fitness instructors, and the medication user. Each exerciser should be monitored and reviewed at regular intervals. Medications may be a blessing for some elderly people, and a catastrophe for others, largely dependent upon the individual physiologic response of the user and their particular pattern of nutrition and lifestyle. Non-drug therapy should be employed whenever possible. However, if medications are necessary, using the fewest possible drugs in the smallest effective dose ranks high in preventing or lessening adverse drug effects. (CB)

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DRUGS AND THE ELDERLY: IMPLICATIONS FOR EXERCISE INDULGENCE

by

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It is not uncommon for people past 60, to use one or more medications each day, either prescription or non-prescription -- and the tendency to need more drugs for various ailments as we become older (chronologically superior), intensifies. Although the elderly constitute 11.5 percent of the population, they consume about 25-28 percent of all prescribed drugs (1). This means that older persons take more than 3 times as many drugs as most young people.

In addition to the potential hazards associated with drug ingestion--a report from the National Health Care Expenditures Study Group indicates that Americans spent $11 billion on prescription drugs in 1980, and an additional $2.6 billion on non-prescription medications (2). The cost of drugs can be significant for persons with fixed incomes for whom chronic illness extends over a number of years. For example, the approximate annual cost for the arthritic patient taking such drugs as Motrin is $400.00, the hypertensive patient ingesting Propranolol is $275.00, and the depressed individual using amtriphyline, like Elavil is $200.00--and the list goes on for diabetes, Parkinson's, gastro-intestinal complaints and other diseases. It has been estimated that 20% of out-of-pocket expenses of older persons are for medicines (3).

Physical educators, fitness leaders and older persons themselves often ask: "what effects do medications have upon older adults who indulge in exercise and fitness programs? Exercise can be an important adjunct with the use of medications for the elderly since sensible physical activity may reduce,

not only dosage requirements, but also the side effects of many drugs. For example, we know that in many cases, judicious exercise participation can lower blood pressure, thus lessen the need for diuretics, beta blockers or both. Physical activity may also reduce the dosage and frequency need of older persons taking insulin for maturity-onset diabetes.

Administration of antidepressive drugs can be curtailed, and in some cases eliminated by the feeling of "well-being" that normally occurs with exercise exertion. For example, deVries (4) has shown that moderate exercise is an effective tranquilizer. Using electromyographical procedures in assessing muscular tension, he found that a 15-minute walk at a moderate rate (sufficient to raise heart rate to 100 beats per minute) was effective in bringing about a calming result greater than Meprobamate.

Exercise and sweating depletes sodium deposits from the skin. Heart, lungs and blood vessels are toned up to bring blood more efficiently to the muscles and brain -- and stimulates the production of chemicals in the body that give a sense of well-being and combat depression. They are natural pain killers. These endorphins and enkaphalins are a class of hormones that have a direct influence on activities of the nervous system. Because some discomfort and exertion is associated with exercise, our bodies release substances that kill pain. The so-called "runner's high" has been attributed to the effects of endorphin. Moderate exercise of an aerobic nature, such as walking, jogging, biking, swimming, and similar continuous type skills can induce feelings of well-being, and create a natural buffer against depression without the side effect hazards antidepressant drugs.

The elderly are subject to more illness and disability than their younger counterparts. Since older people take more medicines, the effects of multiple

drugs are greater because of normal physiological changes that occur in the maturing organism. The liver and kidneys, which are responsible for clearing most medications from the body, become less efficient so that they remove drugs more slowly. Slower clearance allows certain drugs to accumulate, and even standard doses can produce unwanted side effects. Body size, amount of body fat, amount of muscle, and the size of the brain and heart, all affect how medications are absorbed.

In general, biologic changes related to aging alter the requirements for medical prescription. The adage -- "start low" -- "go slow" relative to dosage and frequency of most medications is safe advice for prescriptive drug use, keeping in mind that the same medication and dose may help some individuals, yet harm others. We know that older people are also likely to have several chronic diseases for which they are receiving medications. Knowing the characteristics of medicines before ingestion, and their possible side effects; and interaction with other drugs is important for minimizing the misuse of medications. The following remarks are focused on several drugs and conditions common among persons 50+ namely, cardiovascular disorders, arthritis, certain musculoskeletal disorders, such as osteoporosis, and maturity-onset diabetes.

Many elders take an assortment of drugs for at least one of these diseases -- and it is not unusual for a person to take medications for all four. This discussion examines each condition with reference to those individuals who want to participate in some aspect of physical activity and exercise.

Cardiovascular disorders are the most common cause of death, and it is

interesting to note that those who reside in nursing homes receive more medications for heart-circulation problems than for any other systemic ailment. First, it must be emphasized that before any program of physical activity is pursued, exercisers should secure medical clearance and approval from their physician. This step is essential for the safety of the participant, as well as for the legal protection of leaders involved in the conduct of the program.

Nitrates such as Nitroglycerin and beta blockers, which are used as antianginal agents may cause excessive drops in blood pressure. Such states can result in unexpected dizziness, lethargy and fatigue. These symptoms also reflect inadequate blood flow (oxygen) to the brain. The alert fitness instructor should be aware of those participants using these drugs and the possibility of fainting or dizziness spells. Prolonged standing, heavy exercise and exertion should be avoided. Carefully determined progressive rates and intensity levels of exercise should be approved by the physician and monitored regularly.

Beta blocking agents such as Inderal and Tenormin decrease myocardial oxygen consumption causing a reduction in heart rate, blood pressure and heart muscle contractility. Consequently, exercise target heart rate schedules designed for the individual without cardiovascular dysfunctions should not be indicated for those exercisers taking medications. Exercise modes such as walk/jog, and cycling using lower adjusted exercise rates are appropriate as designated by physician.

Adrenergic blockers and vasodilators are agents frequently used for the relief of hypertension. These drugs lower pressure by relaxing blood vessels,

altering excitation responses to the heart or relieving excess body fluid. Since systematic exercise tends to lower blood pressure, careful attention should be given to the intensity and duration of exercise patterns, which may trigger abnormally lower blood pressure states. Exercise routines with 5 to 10 minute warmups, and similar cool down periods are important elements of the workout, and allow for natural and gradual blood pressure adjustments.

Since isometric exercise tends to raise blood pressure more than isotonic exercise, it is advisable for hypertensive individuals under medication to avoid static routines, and instead, engage in dynamic modes such as walking, swimming or other continuous type motor skills.

The heart beats continuously at an average of 72 beats per minute, circulating over 2,000 gallons of blood each day. (5). The heart rate is regulated automatically by neurons stemming from the nervous system known as vagus and sympathetic nerves. Stimulation of the vagus nerves slows down the heart, whereas activation of the sympathetic nerves speeds up the rate. For most individuals without cardiac dysfunctions, exercise tends to stimulate vagal tone, thus lowering the heart rate. It is not unusual to find younger and older runners possessing heart rates of 60 beats per minute and lower.

For some mature seniors, irregular heart beats known as arrhythmia develops and persists. One of the most common types of arrhythmia is tachycardia (abnormally fast heart action). Such drugs as Quinidine and Procaine, which stimulate the vagus nerves and slow down the heart rate, are commonly used. These medications can cause a number of side effects such as dizziness, blurring of vision, drowsiness and headache. Individuals using

these agents should be carefully monitored--and exercise may be contraindicated, depending upon the nature and severity of the dysfunction. Isometric exercise is inadvisable because of its interference with blood flow and the probability of inducing serious ventricular arrhythmias or ischemia.

Anticoagulant agents such as Heparin and Coumadin are two common drugs used for the reduction of blood clots associated with embolisms. The seriousness of blood clots is well known since an obstruction within the brain can result in a stroke, and a clot lodged in the heart can cause coronary thrombosis. Anticoagulants are used to decrease normal clotting of the blood for the purpose of reducing stroke and coronary attacks. Individuals using blood thinners over an extended period of time need to be alert to small cuts because of user tendency for continued bleeding. Additionally, aspirin and anti-arthritic drugs increase the effects of anticoagulants. Thus, such anti-inflammatory medications can be hazardous to persons who are also on anticoagulants. The risk of bleeding while on Heparin increases with age. Exercises that are less likely to result in falls and collisions should be encouraged. Activity areas and exercise equipment should be free of obstructions and collision hazards that may bruise or cause skin cuts. Mild exercises, accenting flexibility and muscle toning without heavy exertions are preferred for persons using anticoagulant agents.

Digitalis therapy is another drug used for degenerative heart disease and excessive rapid heart rate. Compounds such as Digoxin and Digitoxin, which are glycoside agents, are prescribed for the purpose of strengthening the heart beat while reducing its rate. Digitalis preparations are cumulative -- that is, they tend to build up in the body, and over a period of time can cause

nausea, appetite loss, weakness, dizziness and mood disturbances. Extreme caution with any exercise regimen is advised for adults taking digitalis, since these preparations are used for serious cardiomyopathy and certain types of arrhythmias. Vigorous and sustained physical exercise is contraindicated in these cases. Low-gear, and mild forms of dynamic movement, such as walking and slow stretching to maintain sufficient levels of energy for daily living and leisure activities are advisable -- and only completed with the physician's approval.

A number of disorders affecting the musculoskeletal system range from simple muscle strains to severe osteoporosis and rheumatoid arthritis. These ailments limit mobility, which often generate pain that signal a temporary suspension of physical activity, and the introduction of drug therapy for the relief of aching, swelling and inflammation.

Arthritis and osteoporosis are common musculoskeletal problems that invade senior adult lives. Subsequently, an assortment of medications usually follow in attempts to relieve accompanying pain.

Generally, drug prescription for arthritis begins with aspirin moving upward in a pyramid fashion, from a toxic effect perspective, to anti-inflammatory nonsteriodal drugs, such as Motrin, Indocin, then progressing to antimalarial agents, gold compounds--and finally Corticosteriods. Corticosteriod or steriod agents, are the most potent anti-inflammatory drug available. They are also the most toxic--and their use is particularly discouraged for elderly persons with arthritis. Steriods should only be used for specific reasons (functional incapacity) and monitored closely.

Two of the most common types of arthritis are rheumatic arthritis and osteoarthritis. R.A. is usually highly inflammatory to the affected joints and rises dramatically with age among women. Somehow, the body's antibody immune system is disrupted causing inflammation in the synovial membrane of the joint. Hands are first affected, followed by the wrist, knee, shoulder and hip. The spine may also be attacked early in the disease.

The role of exercise is important for restoring and sustaining joint range and mobility. Drugs play an important part in the relief of pain--however, due to the individualized reaction, certain medications may help alleviate pain for some people, and on others, cause such toxic reaction that drug agents become ineffective. For example, sustained dosage of aspirin is a successful anti-inflammatory agent for many older persons, but for some individuals, gastrointestinal bleeding can result -- additionally, aspirin can cause internal ear problems such as tinnitus (noises) and decreased hearing. Drugs increase in their toxic affects, from aspirin to stercids causing headache, dizziness, nausea, interruption of blood platelet formation and flare-ups of hives and rash. Each medication level should be carefully monitored.

The use of such agents as Indocin, Butazolidin, Motrin, Clinoril, Feldene which represent common anti-inflammatory drugs have been used with success for arthritics--however some individuals may find great relief while others may experience such adverse effects that drug ingestion is intolerable.

Gold compounds, which are used primarily in the treatment of R.A., are usually administered by injection with varying degrees of benefit. Adverse side effects include skin rash and irritations to the mucous membranes.

Antimalarials, such as Atabrine are also used to treat R.A. may cause some vision impairment, headache and stomach problems.

The key to success with arthritic medications is to find a balanced mix of appropriate drugs, dosage, exercise and rest. Probably one of the most effective anti-drug medication that we are all familiar is swimming. For those elders who cannot partake in aquatic activities, passive to active slow stretching exercises are advisable.

Perhaps one of the most popular health topics discussed today, especially among women, is osteoporosis. This paper will not delve into every aspect of osteoporosis, but will discuss some of today's medications used for the improvement of bone integrity, and suggest the place of exercise for the development bone mass.

First, we know that small-boned caucasian women are particularly vulnerable to bone loss. According to some estimates, one of every three women in the U.S. has osteoporosis or will eventually develop the disease. Although the specific cause of osteoporosis is not known, we do know that such factors as genetics, hormones, nutrition and physical activity affect bone health. It is generally recognized that management of this bone disease entails supplemental dosages of calcium and vitamin D -- and in some cases estrogen or flouride treatment under careful medical supervision. The most serious risk with estrogen therapy is its link with endometrial cancer. Some studies suggest that estrogen administration increases the risk of cancer fivefold. The risk seems to rise with duration of therapy and may be related to dosage. It has also been found that estrogen therapy increases the risk of hypertension

and myocardial infarction. Although estrogen can help some women -- its continued use poses a significant risk that requires individualized medical prescription.

Floride administration may increase bone density, however, its side effects can negate its benefit. Flourides tend to irritate the gastro-intestinal tract and can cause gastritis as well as other intestinal disturbances. The work of Everett Smith (6) at the University of Wisconsin and John Aloia (7) in New York lends support to the positive role of physical activity as one mode of preventing bone loss.

Exercise appears to increase bone mass chiefly in the specific areas where skeletal forces are exerted. For example, tennis players contain greater bond density in their playing arms (8). We need more research in this area to specifically indicate, what type, intensity, and optimum frequency is best for preserving skeletal health. Meanwhile, it is wise for most people to engage in some form of physical activity, in addition to calcium supplementation for the prevention of osteoporosis.

Finally, I would like to briefly comment on the role of exercise and drugs in the management of maturity-onset diabetes. We know that this disorder involves genetics, and is more prevalent among obese individuals. Most diabetics over 65 can be controlled with diet, and oral hypoglycemic agents such as Orinase, Diabinese, Dymelor or Tolinase. These drugs tend to increase the release of insulin from the pancreas, and subsequently lower blood sugar levels.

Two problems can develop among diabetics with respect to exercise and

physical activity; specifically, (1) hypoglecemia and (2) hyperglecemia. The hypoglycemia effect (hypo) means that too little sugar is deposited in the circulatory system whereas the hyperglecemic effect indicates the reverse, or too much glucose accumulates in the blood. Exercise has an insulin-like consequence -- that is, it reduces the sugar content in the system. Thus prolonged physical activity may cause hypoglycemia, unless the intensity and frequency are regulated. It is important to remind the diabetic exerciser that nourishment in the form of sugar, fruit juice, or some other digestible carbohydrate should be taken if low blood sugar symptoms occur, such as weakness, palor, or mental confusion. On the other hand, not enough exercise and inadequate insulin intake can create hyperglycemia (too much glucose in the blood) with similar symptoms of hypoglecemia such as weakness, palor, and in some cases, unconsciousness.

Exercise without control of insulin ingestion and diet can disturb metabolic regulatory metabolism. Diabetic coma can occur when too much sugar appears in the blood. Insulin shock may be caused by an overdose of insulin, too much exercise, or too little carbohydrate food.

Oral hypoglycemic agents allow the diabetic to avoid hyperdermic injections, however, a regimen of oral drug intake requires persistent attention to correct dose, regulation of diet and exercise. Diabetics can participate in most sports and physical activities. However, special precautions with footwear, and the avoidance of sores or skin infections should be taken. Regular exercise, especially of the endurance type such as walking, jogging, cycling and swimming reduce the need for insulin. Such practices as avoiding strenuous physical activity before a meal is advised. Also, using the abdomen or arms (if legs are involved in exercise areas) are preferred

injection sites since increased circulation in the exercised part allows insulin to be absorbed too fast (9). Exercising diabetics should also consume foods that are high in carbohydrates and low in fat and protein. Physical activity and exercise improves the relationship between glucose tolerance and insulin response essentially by lowering the insulin requirements of the biological systems.

In summary, many age related biologic and physiologic changes can have important influences on drug pharmacology in elderly persons. Successful management depends upon good communications among health care providers, fitness instructors and the medication user. Each exerciser should be monitored and reviewed at regular intervals. Medications may be a blessing for some, and catastrophe for others, largely dependent upon the individual physiological response of the user and their particular pattern of nutrition and life style. Non-drug therapy should be employed whenever possible, however, if medications are necessary, using the fewest possible drugs in the smallest effective dose, ranks high in preventing or lessening adverse drug effects.

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